

### **REMARKS**

In the Office Action, claims 1-24 were rejected. By the present response, claims 1, 12, 14, 16, 18, 22 and 24 have been amended. Upon entry of the amendments, claims 1-24 remain pending in the present patent application. Reconsideration and allowance of all pending claims are requested.

### **Claim Objections**

Claims 1-11, 14, 16, 18 and 24 were objected for certain informalities. Applicants respectfully submit that claim 1 has been amended to correct the antecedent basis of “each coil”. Claim 14 has been amended to recite that the reference sensitivity maps are generated using a phantom. Claims 16, 18 and 24 have been amended to include structural recitations for the functions recited to the claims. Accordingly, Applicants respectfully request the Examiner to withdraw the objections to 1-11, 14, 16, 18 and 24.

### **Rejections under 35 U.S.C. §102**

Claims 12, 14-16, 19, 21-24 were rejected under 35 U.S.C §102 (b) as being anticipated by Eggers et al. (U.S. Published Patent Application No. 2003/0016015, hereinafter “Eggers”). Applicants respectfully traverse the rejection.

Claim 12 recites a magnetic resonance imaging system comprising a coil array configured to receive a plurality of signals to generate magnetic resonance images, wherein said coil array is configured to obtain partial gradient phase encoding signals from a subject and receive signals from a fiducial mark provided with each coil *in an interleaved manner*. The MRI system further comprises an image reconstructor configured to update sensitivity maps by using the intermittently received signals and reference sensitivity maps. The image reconstructor is further configured to construct magnetic resonance images based on the updated sensitivity maps and the partial gradient phase encoding signals.

Claim 22 recites a magnetic resonance imaging system comprising a coil array configured to receive a plurality of signals and a controller configured to generate sensitivity maps from the plurality of signals, wherein said coil array is further configured to collect partial gradient phase encoding signals from a subject, said coil array is configured to receive signals from at least one fiducial mark provided with each coil and the partial gradient phase encoding signals from the subject *in an interleaved manner*.

**Eggers fails to disclose obtaining partial gradient phase encoding signals from a subject and receiving signals from a fiducial mark provided with each coil in an interleaved manner.**

Applicants respectfully submit that Eggers fails to teach or disclose obtaining partial gradient phase encoding signals from a subject and receiving signals from a fiducial mark provided with each coil *in an interleaved manner*. Instead, Eggers clearly discloses that the determination of the position and orientation of the coil takes place continuously during the acquisition of the MR data. *See*, Eggers, paragraph 31. Nowhere does Eggers teach or disclose obtaining partial gradient phase encoding signals from a subject and receiving signals from a fiducial mark provided with each coil *in an interleaved manner*. For at least this reason, Eggers cannot anticipate independent claims 12 and 22. Accordingly, Applicants respectfully submit that independent claims 12 and 22, and claims depending therefrom are allowable, and respectfully request the Examiner to reconsider and withdraw the rejection of the claims.

**Rejections under 35 U.S.C. §103**

Claims 1-3, 5-11, 20 were rejected under 35 U.S.C §103 (a) as being unpatentable over Eggers in view Jakob et al. (U.S. Patent No. 6,289,232, hereinafter “Jakob”) and Magnusson et al. (U.S. Patent No. 5,592,083, hereinafter “Magnusson”) or DeMeester et al. (U.S. Patent No. 6,552,538, hereinafter “DeMeester”).

Claim 1 recites a method for calibrating coil sensitivity profiles. The method comprises generating reference sensitivity maps for a plurality of coils, imaging a subject, *interleaving*, with said imaging of the subject, imaging of at least one fiducial mark provided with each coil, and deriving, based on the coil positioning and coil loading, actual sensitivity maps from the reference sensitivity maps. As discussed above, Eggers fails to disclose *interleaving*, with imaging of the subject with imaging of at least one fiducial mark provided with each coil. Jakob, Magnusson and DeMeester do not obviate the deficiencies of Egger.

Jakob discloses an MRI system that uses an autocalibration technique. The technique determines coefficients by fitting measured signals to an autocalibration signal acquired with a gradient of different offset or orientation. This calibration procedure defines the coefficients of a transformation, which may be applied directly to collected signals to fill a spatial data matrix using a smaller set of measured signal data acquired using a reduced set of conditioning or data acquisition steps. The data matrix is then transformed to yield an accelerated MR image of increased resolution or decreased acquisition time. In another embodiment, a reduced set of lines is acquired corresponding to an aliased image, and an additional set of central data lines are acquired to form a low resolution image. A de-aliasing transform is then formed using the low resolution image. *See*, Jakob, column 6, lines 30-50.

The Examiner cited Magnusson and DeMeester for teaching a technique to measure coil loading. However, neither Magnusson nor DeMeester teach, suggest or disclose interleaving imaging of the subject and imaging of at least one fiducial mark provided with each coil. In particular, Magnusson discloses a system for detecting explosives and such substances in a closed package. Magnusson's system does not use fiducial markers and therefore does not image fiducial markers at any point. Similarly, DeMeester does not use fiducial markers and therefore does not teach, suggest or disclose interleaving, with said imaging of the subject, imaging of at least one fiducial mark provided with each coil.

Thus, neither Jakob nor Magnusson nor DeMeester teach, suggest or disclose the interleaving of imaging of a subject and a fiducial marker recited in claim 1 and missing from Eggers. Consequently, no combination of Eggers, Jakob, Magnusson and DeMeester could establish a *prima facie* case of obviousness of claim 1. Claim 1 and the claims depending therefrom are therefore believed to be clearly patentable over the cited combination. Their reconsideration and allowance is respectfully requested.

Claim 4 is rejected under 35 U.S.C §103 (a) as being unpatentable over Eggers in view Jakob and Magnusson or DeMeester and further in view of Lee et al. (U.S. Published Patent Application No. 2001/0043068, hereinafter "Lee"). Claim 13 is rejected under 35 U.S.C §103 (a) as being unpatentable over Eggers in view Jakob. Claim 17 and 18 is rejected under 35 U.S.C §103 (a) as being unpatentable over Eggers. The claims rejected under this section depend directly from independent claim 1 and 12, respectively. As summarized above, Eggers is not believed to teach, suggest or disclose each and every element of independent claim 12. Moreover, Eggers in combination with Jakob and Magnusson or DeMeester fail to teach, suggest or disclose each and every aspect of claim 1. Consequently, claims 4, 13, 17 and 18 are believed to be patentable both by virtue of their dependency from an allowable base claim, as well as for the subject matter they separately recite. Reconsideration and allowance of dependent claims 4, 13, 17 and 18 on this basis are requested.

**Conclusion**

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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